

AN INEXPENSIVE RE-CIRCULATING SEA-WATER SYSTEM

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SOME PHASES OF THE WORK carried on by the Bureau of Commercial Fisheries at Galveston, Texas, require the use of facilities for holding shrimp and other marine animals for experimental use. In the absence of a running sea-water system, a re-circulating system is a desirable substitute to keep the animals in the best possible condition. The disadvantages of using water pumps, standpipes, and other equipment containing metal in such a system are well known to workers in the marine field. Certain metallic ions are extremely toxic to some organisms. Corrosion, moreover, is a serious problem.

With the recent development of polyethylene, a relatively inert material, we were able to construct--almost completely from standard polyethylene items--the re-circulating system described here. The complete lack of contact of any metal with the water makes the system especially suitable for marine work. A simple method of waterproofing tanks for use as aquaria is also described.

The system, shown in figure 1, consists of three holding tanks, a reservoir tank, a water pump, and a filtering unit. The animals are placed in the holding tanks, which are set above the reservoir tank. Water is pumped from the reservoir tank to each of the holding tanks and to the filtering unit. From the holding tanks and filtering unit, the water drains directly back into the reservoir by means of a standpipe, thus completing the circuit.

The holding tanks were made from 3/4-inch marine plywood. Each tank measures

4 feet long, 2 feet wide, and 1 foot high, and has a capacity of 60 gallons. The tanks were waterproofed by coating them with Fiberglas resin commonly used in repairing boats. For bonding purposes, the use of unpainted wood in making the tanks is recommended. The resin is ordinarily used in conjunction with Fiberglas cloth for added strength. One tank was lined completely with Fiberglas cloth and resin, but we felt that the added strength was unnecessary and did not justify the higher cost. Instead, Fiberglas-cloth tape, 3 inches in width, was applied to the inside seams of the tanks to reduce the chances of developing leaks. If the tanks are well made with glued dado or rabbet joints, the tape can probably be eliminated. The resin is easily applied with a paint brush, and several coats are recommended. After drying, the surfaces are smooth and easy to clean.

The standpipe unit (figure 2) was constructed from integral parts of a polyethylene sink trap. The unit consists of a standpipe, an outlet flange, and a flange locknut.

Standpipes used in marine aquaria are generally made of Pyrex pipe, which is expensive, subject to breakage, and difficult to cut to size without special equipment. The polyethylene standpipe is inexpensive, practically unbreakable, and easy to cut with a hacksaw or sharp knife.

The outlet flange and flange locknut, when used, are generally made of metal. In time, corrosion sets in and the units are virtually "frozen" to the tank. Besides adding no metal to the water, the

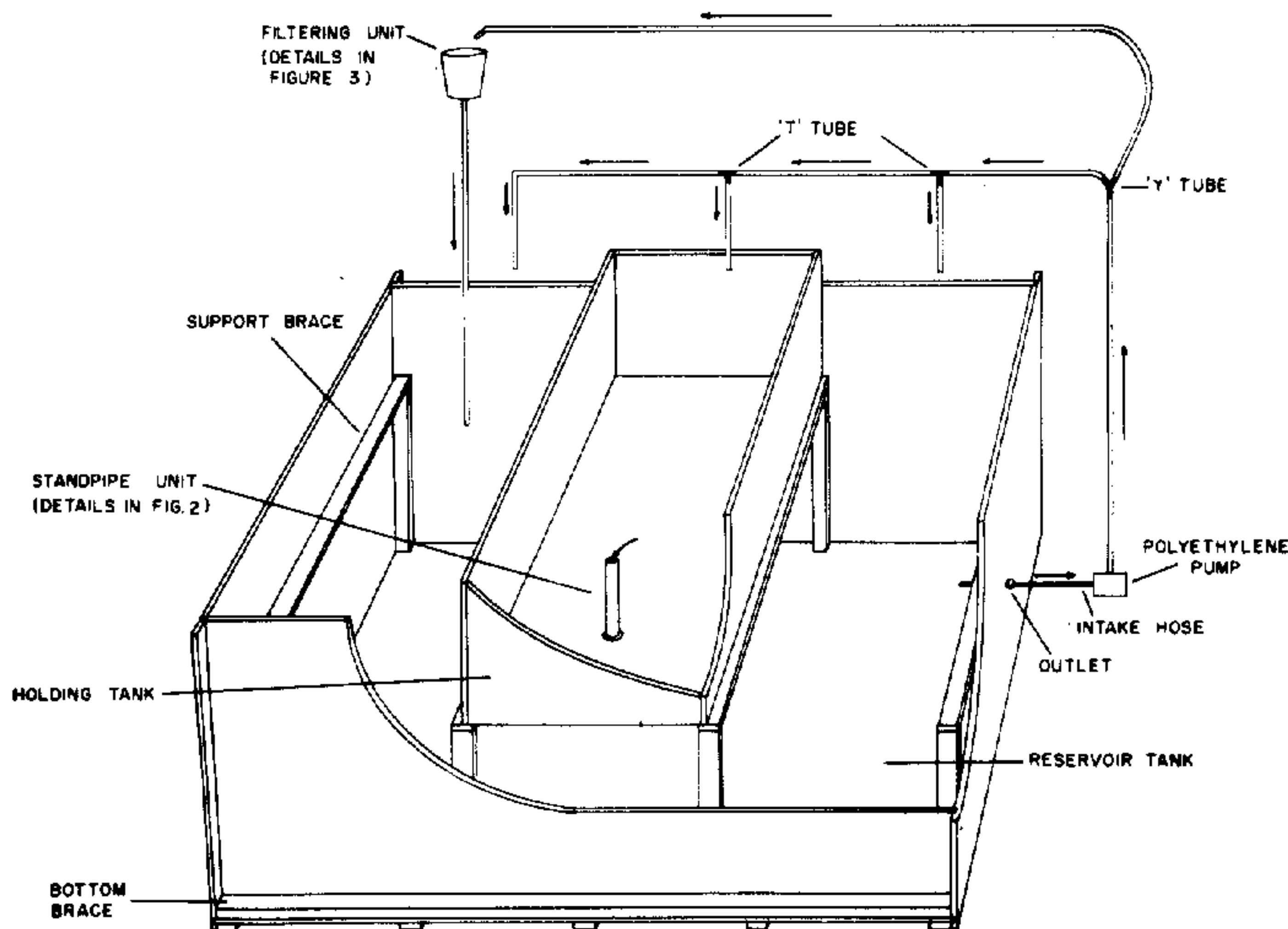


FIGURE 1.--Re-circulating sea-water system. The reservoir tank and a holding tank are cut to show construction details. Two holding tanks are not shown. Arrows indicate direction of water flow.

The holding tanks rested partly within the reservoir tank, so that the capacity of the latter was reduced to about 550 gallons. Waterproofing was accomplished by use of Fiberglass resin and tape.

A hole 2 inches in diameter was drilled in one end of the reservoir

tank to provide an outlet. The outlet was tapped about a foot from the bottom in order to avoid sucking up accumulated silt on the bottom of the tank. Polyethylene tubing was connected from the outlet to a water pump which distributed water to each of the three tanks. Aeration was accomplished by jetting the water into each of the tanks. Another line from the pump led to a filtering unit. Water drained through the filter directly into the reservoir tank at the end opposite the outlet.

The outlet from the reservoir tank can be eliminated by placing the intake hose directly in the reservoir tank; but in case of intermittent power failure, the pump will lose its prime and it may be damaged seriously.

We made use of a centrifugal-type pump, powered by a 1/35-hp., 3,000-r.p.m. motor. The holding tanks rested partly within the reservoir tank, so that the capacity of the latter was reduced to about 550 gallons. Waterproofing was accomplished by use of Fiberglass resin and tape. A hole 2 inches in diameter was drilled in one end of the reservoir

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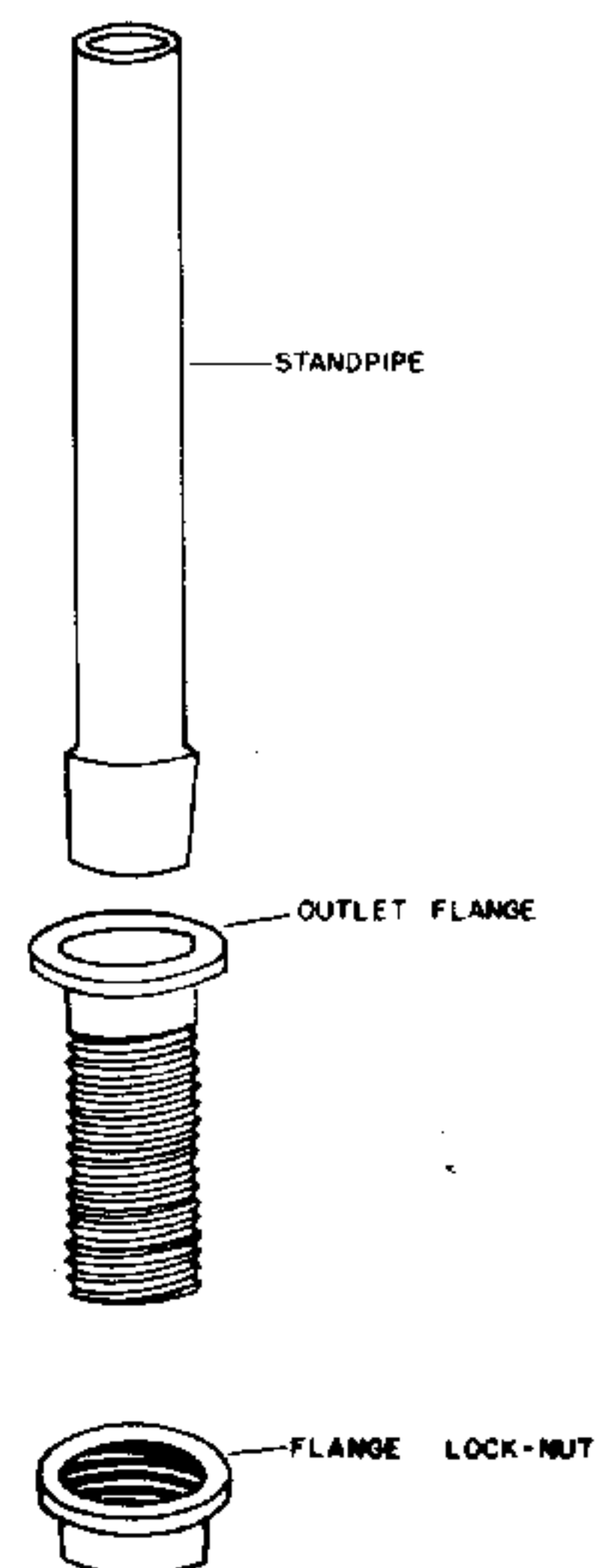


FIGURE 2.--Standpipe unit.

that was capable of effecting a flow of 45 gallons per hour in each tank and in the filter. The unit is compact, measuring approximately 6 inches by 4 inches by 4 inches. In operation, it is very quiet. Most important of all, both the pump head and the impeller are made of polyethylene.

The filter (figure 3) was made primarily from polyethylene items available in many stores and found commonly in kitchens. Small holes were drilled in the bottom of a small polyethylene wastebasket, and the bottom was lined with a piece of saran screening. A 2-inch layer of activated charcoal was placed on top of the saran. A colander containing glass wool was nested on top of the wastebasket. The entire unit was then placed in a larger container that had an outlet tapped in the bottom for the filtered water to drain into the reservoir.

This re-circulating system has proved highly satisfactory. Fish, postlarval and adult shrimp, and other invertebrates have been held indefinitely in the tanks without appreciable mortality. The cost of the apparatus is considered relatively

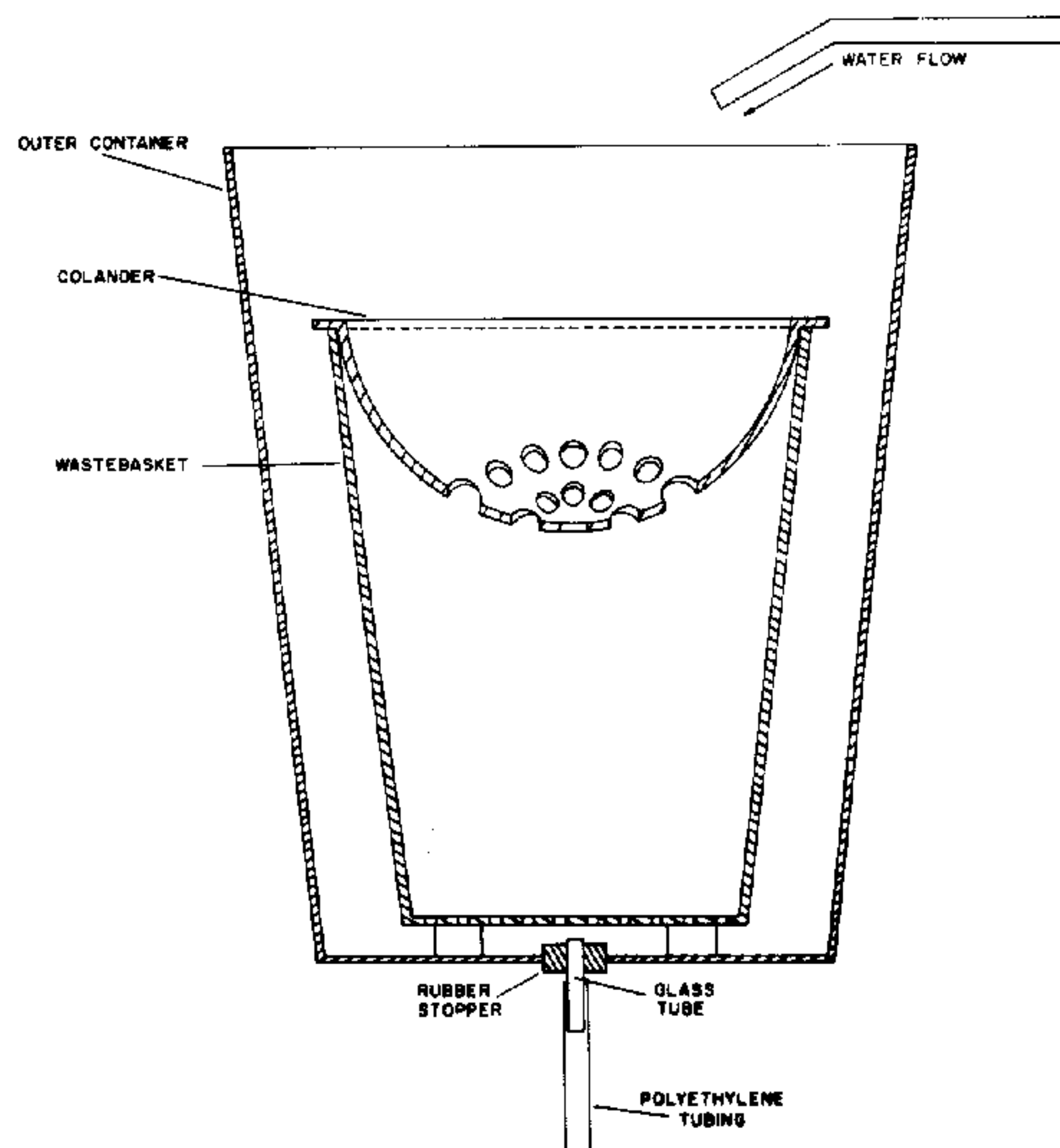


FIGURE 3.--Filtering unit.

inexpensive, amounting to slightly more than \$100.

